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10/582,903	11/17/2006	Josef Pozivil	M03B334	5002

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EXAMINER	
BAYOU, AMENE SETEGNE	
ART UNIT	PAPER NUMBER
3746	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/582,903	POZIVIL ET AL.	
	Examiner	Art Unit	
	AMENE S. BAYOU	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01/19/10*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 01/19/10 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-4,6-7,9-16 are rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki (Japanese patent publication JP10121913) in view of Seki (US patent 4015436).

4. In re claim 1, Toshiaki discloses a compressor system including:

- Rotary liquefied natural gas boil-off compressor ,in figure 1,comprising at least two compression stages (22,24) in series , a gas passage (26) passing through the series of compression stages (22,24) ,the gas passage (26) extending through and being in heat exchange relationship with at least one cooling means (27) disposed between the compression

stages (22,24) , wherein the at least one cooling means (27) is a cryogenic cooling means (see abstract). Toshiaki,however fails to disclose the following limitation which is taught by Seki:

- Cryogenic cooling means having valve means (7), for controlling flow of coolant into the cooling means in response to the inlet temperature, or a related parameter, of the compression stage (1) downstream of the cooling means to maintain inlet temperature at a temperature between chosen sub –ambient temperature limits, in figure 1 ,abstract and column 2,lines 26-31 and column 2,lines 59-column 3,line 45.

5. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Toshiaki by including a valve system before after the cryogenic cooler but before a stage of a compressor as taught by Seki in order to automatically monitor or adjust the temperature of the working fluid.

6. In re claim 2 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Stepner discloses:

- The cryogenic cooling means comprises an indirect cooling means ,in figure 1.

7. In re claim 3 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- The cryogenic cooling means comprises a direct cooling means, in figure 1.It would have been obvious to one skilled in the art at the time the invention was made to choose a direct cooling (injection) method as taught by Seki because of simplicity that does not require complicated piping line.

8. In re claim 4 Toshiaki in view of Seki as applied to claim 3 disclose the claimed invention:

Seki discloses:

- The direct cooling means comprises a chamber (inherently) having an inlet for the introduction of a cryogenic liquid, in figure 1.

9. In re claim 6 and 7 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention except mentioning that there is a cryogenic cooling means intermediate each pair of successive compression stages. But the compressor of Stepner and Seki is a two stage compressor and It would have been obvious to one having ordinary skill in the art at the time the invention was made to install a cryogenic cooling means (either direct or indirect type based on design choice) in between each pair of successive compressor stages (if there are more stages such as three or more) because it is a mere duplication and it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. St. *Regis Paper Co. v. Bemis Co., 193 USPQ 8.*

10. In re claim 9 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Toshiaki discloses:

- There is a cryogenic cooling means (35) downstream of the final compression stage (35), in figure 2.

11. In re claim 10 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- There is a cryogenic cooling means (6) upstream of the first compression stage , in figure 1. It would have been obvious to one skilled in the art at the time the invention was made to include a cryogenic cooler upstream of the first stage of the compressor of Toshiaki as taught by Seki in order to lower the temperature of the incoming gas.

12. In re claim 11 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention since the “compressor” does not specify which compressor stage and the heat exchangers disclosed by both Toshiaki in view of Seki can be considered as forced liquefied natural gas vaporizer.

13. In re claim 12 Toshiaki in view of Seki as applied to claim 1 disclose the claimed invention:

Seki discloses:

- A liquefied natural gas storage tank (2) having an outlet for boiled-off natural gas communicating with a compressor (1) the cryogenic cooling means (6) in communication with the liquefied natural gas in the storage tank (2) ,in figure 2.

14. In re claim 13 -16 Toshiaki in view of Seki disclose a method of operating a liquefied natural gas compressor because under the principles of inherency, if

a prior art device, in its normal and usual operation, would necessarily perform the method claims, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. *In re King*, 801 F.2d 1324,231 MPEP 2112.02.In regards to the temperature range stated in claim 14 please note that Seki teaches the same range in column 2,lines 59-68.In regards to the pressure ratio stated in claim 15 and 16 It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage because the choice merely depends on design criteria and it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233.

15. Claims 5 is rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki in view of Seki as applied to claim 4 further in view of Khan et al. (reissued US patent number 33408).

16. In re claim 5 Toshiaki in view of Seki disclose the claimed invention except the following limitation which is taught by Khan et al:

- The outlet of the direct cooling means (74) communicates with a vessel (100) adapted to disengage particles of liquid from the natural gas, the vessel (100) having an outlet (102) for natural gas communicating with compression stage (86),in figure 2 and column 4,lines 43-45.

17. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Toshiaki and Seki by installing separator that communicates with the direct heat exchanger as taught by Khan et al in order to separate the gaseous and liquid phases.

18. Claims 8 is rejected under 35 U.S.C 103(a) as being unpatentable over Toshiaki in view of Seki as applied to claim 7 further in view of Sterlini (US patent number 4187899).

19. In re claim 8 Toshiaki in view of Seki disclose the claimed invention except the following limitation which is taught by Sterlini:

- An inlet of a direct cooling means communicates with an outlet of an indirect cooling means , in figure 6.

20. It would have been obvious to one skilled in the art at the time the invention was made to communicate (directly or indirectly) the direct cooling means and the indirect cooling means as taught by Sterlini in order to have heat exchange process and lower the temperature of one of the fluid. Please note that in regards to the limitation "cryogenic cooling", the system of Toshiaki and Seki involve cryogenic cooling.

Alternate Claim Rejections - 35 USC § 103

21. Claims 1-4, 6-16 are rejected under 35 U.S.C 103(a) as being unpatentable over Swearingen (US patent number 3889485) in view of Blotanberg (US patent number 4362462).

22. In re claim 1 Swearingen teaches process for liquefying natural gas including:

- Rotary liquefied natural gas boil-off compressor (35,12,19,20),in figure 3,comprising at least two compression stages (35,12) in series , a gas passage (10,11,17) passing through the series of compression stages (35,12,19,20) the gas passage (10,11,17) extending through and being in heat exchange relationship with at least one cooling means (18) disposed between the compression stages (between 35 and 12 or between 12 and 19) , wherein the at least one cooling means (18) is a cryogenic cooling means (even the temperature of the last stage compressed fluid exiting heat exchanger 18 which is point 22 is -230 ^{0} F as indicated in column 7,lines 48-50.See also figure 2). Swearingen ,however fails to teach the following limitation which is taught by Blotanberg :
- There is valve means (38, 48), in figure 2 for controlling (via controller 46, 48) flow of coolant into the cooling means (16, 18) in response to the inlet temperature, or a related parameter, of the next compression stage (12 or 14) next in series downstream of the cooling means (16 or 18) to maintain inlet temperature at a temperature between chosen sub ambient temperature limits, in column 4, lines 29-62.

23. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Swearingen by including a valve system for the inter stage intercoolers as

taught by Blotanberg in order to automatically monitor or adjust when needed the correct working temperature of the working fluid.

24. In re claim 3 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The cryogenic cooling means comprises a direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3).

25. In re claim 2 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The cryogenic cooling means (18) comprises an indirect cooling means (separate flow lines 18a-18d and no fluid mixing), in figure 3.

26. In re claim 3 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen '485 discloses:

- The cryogenic cooling means comprises a direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3).

27. In re claim 4 Swearingen in view of Blotanberg as applied to claim 3 disclose the claimed invention:

Swearingen discloses:

- The direct cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3) comprises a chamber (the mixing chamber of line 10 and discharge of compressor 12) having an inlet (line 10 can be taken as inlet for the mixing chamber) for the introduction of a cryogenic liquid, in figure 3..

28. In re claim 6 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) intermediate each pair of successive compression stages (35, 12 and 12, 17), in figure 3.

29. In re claim 7 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There are at least three compression stages (35, 12, 17) in sequence and in that there is at least one direct cryogenic cooling means (discharge from compressor 12 and flow line 10 from cryogenic cooler mix resulting heat exchange which is direct cooling means and then delivered to compressor 17 via line 17 in figure 3) and at least one indirect cryogenic cooling means (18), in figure 3.

30. In re claim 8 Swearingen ‘485 in view of Blotanberg ‘462 as applied to claim 7 disclose the claimed invention:

Swearingen discloses:

- An inlet of a direct cryogenic cooling means (which is discharge from compressor 12) communicates with an outlet of an indirect cooling cryogenic means (which is line 10), in figure 3.

31. In re claim 9 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) downstream of the final compression stage (20), in figure 3.

32. In re claim 10 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- There is a cryogenic cooling means (18) upstream of the first compression stage (12), in figure 1.

33. In re claim 11 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- The compressor (12) has an intermediate inlet communicating with a forced liquefied natural gas vaporizer (18), in figure 3. Please note that the heat exchanger 18 inherently vaporizes the liquefied natural gas during the process of heat exchange.

34. In re claim 12 Swearingen in view of Blotanberg as applied to claim 1 disclose the claimed invention:

Swearingen discloses:

- A liquefied natural gas storage tank (4) having an outlet (33) for boiled-off natural gas (column 8,line 62-63) communicating with a compressor (35) the cryogenic cooling means (18) in communication with the liquefied natural gas (via line 33) in the storage tank (4) ,in figure 3.

35. In re claim 13-16 Swearingen in view of Blotanberg disclose a method of operating a liquefied natural gas compressor because under the principles of inherency, if a prior art device, in its normal and usual operation, would necessarily perform the method claims, then the method claimed will be considered to be anticipated by the prior art device. When the prior art device is the same as a device described in the specification for carrying out the claimed method, it can be assumed the device will inherently perform the claimed process. *In re King*, 801 F.2d 1324,231 MPEP 2112.02.

In re claim 14,It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233. In re claim 15 and 16 It would have been obvious to one having ordinary skill in the art at the time the invention was made to select the inlet temperature range for each compressor stage because the choice merely depends on design criteria and also since it has been held that where the general

conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233.

36. Claims 5 is rejected under 35 U.S.C 103(a) as being unpatentable over Swearingen in view of Blotanberg as applied to claim 4 further in view of Khan et al. (reissued US patent number 33408).

37. In re claim 5 Swearingen in view of Blotanberg disclose the claimed invention except the following limitation which is taught by Khan et al:

- The outlet of the direct cooling means (74) communicates with a vessel (100) adapted to disengage particles of liquid from the natural gas, the vessel (100) having an outlet (102) for natural gas communicating with compression stage (86),in figure 2 and column 4,lines 43-45.

38. It would have been obvious to one having ordinary skill in the art at the time of the invention was made to modify the cryogenic compressor system of Swearingen and Blotanberg by installing separator that communicates with the direct heat exchanger as taught by Khan et al in order to separate the gaseous and liquid phases.

Response to Arguments

39. Applicant's arguments with respect to claims 1-16 have been considered but are not persuasive.

40. In regards to claim 1,applicant in page 2 paragraphs 4 and 5 argued that one skilled in the art would not seek to combine disclosure from Toshiaki and Seki to arrive at the invention of the applicant's claims 1 and 13.Applicant stated that if

one skilled in the art placed the Seki valve in the coolant of Toshiaki such would surely upset the constant rotary speed of the Toshiaki turbine. Further applicant alleged that even if such modification is done one would not arrive at applicant's claimed invention as stated in claims 1 and 13 because interstage cooling of Toshiaki would be left unaltered. Regarding alternate rejections using combination of Swearingen and Blotanberg applicant on page 4 last paragraph and page 5 argued that Swearingen's compressor are involved with different machines having different drives while applicant's claim is a single compressor with a single drive .Further applicant argued that since Blotanberg discloses using water as an interstage coolant it can not be considered a cryogenic fluid and most importantly can not be combined with Swearingen since the water would freeze and thus the whole modification will be inoperable. Examiner respectfully disagrees .

Although it is true that an induction power generator is arranged on an end part of a rotary shaft of the expansion turbine 4 so as to stably hold rotational speed of a turbine it is not clear to the examiner how adding a valve to the inlet of the cooler would upset the rotary speed of the turbine. In fact figure 2 of Toshiaki discloses use of at least two valves 34 and 36 in the structure of the other heat exchanger 35.The whole purpose of the valve is to regulate the flow of coolant based on temperature input so that a desired degree of cooling is achieved.Seki utilizes a valve means (7) to regulate flow of crycoolant.There could be no reason why one skilled in the art at the time the invention was made could not have used such teaching by Seki to add a valve to the structure of Toshiaki in order

regulate the flow rate of cryocoolant. Further applicant's statement that even if such modification is done one would not arrive at applicant's claimed invention as stated in claims 1 and 13 because interstage cooling of Toshiaki would be left unaltered is erroneous.Toshiaki discloses cryocooler between the compression stages (22,24) and thus if the flow rate is regulated based on the modification one would naturally expect that the interstage cooling would be changed. In addition please also note that applicant's claims do not specify that interstage cooling of would be altered. The independent claims merely recite that the flow rate of the cryocoolant is controlled to achieve a desired inlet temperature for the second stage compressor.

Regarding applicant's argument that Swearingen's compressor are involved with different machines having different drives while applicant's claim is a single compressor with a single drive please note that applicant's compressor are at least 4 (see figure 1) each one of which can be considered as separate except that they have a common drive. Applicant didn't specify in the claims that the compressor stages are connected to each other and driven by the same shaft.

Finally applicant's statement that Blotanberg discloses using water as an interstage coolant and thus it can not be considered a cryogenic fluid is erroneous. Please note that Blotanberg's reference is cited only for its disclosure of using a valve means for controlling flow of coolant into a cooling means in response to the inlet temperature or related parameter of the next compression stage. It is immaterial if the coolant is cryogenic fluid or water since the teaching is applied only about the method of controlling a coolant flow by using a valve

means in response to the inlet temperature of the second stage compressor. Only a method (principle) is applied here since a reference is a prior art for all that it teaches. It is abundantly clear to the examiner as it is to the applicant that water freezes at 32 Celsius and can not be operated as coolant below that temperature.

Conclusion

41. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amene S. Bayou whose telephone number is 571-270-3214. The examiner can normally be reached on Monday-Thursday,8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on 571-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service

Representative or access to the automated information system, call 800-786-

9199 (IN USA OR CANADA) or 571-272-1000.

/Charles G Freay/
Primary Examiner, Art Unit 3746

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Examiner, Art Unit 3746